

# Heat Shield Recession Measurements Using Remote Spectral Sensors, Phase II

Completed Technology Project (2016 - 2021)

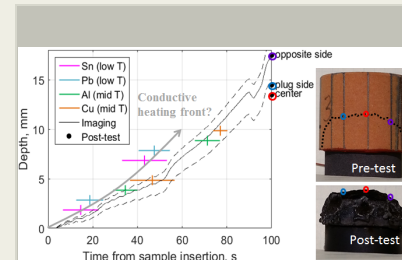


## Project Introduction

OKSI proposes a minimally invasive in-flight diagnostic to measure heat shield recession during flight tests. These measurements can be used to validate models and ultimately optimize heat shield design to reduce weight while maintaining sufficient safety margins. The concept has two components: 1) specially designed heat shield plugs and 2) a remote spectral sensor.

## Anticipated Benefits

NASA is in the process of improving heat shield design either through the use of new heat shield materials or by reducing the thickness of existing heat shields using conventional materials. Currently, NASA heat shield predictive models are not reliably consistent with observed measurements. The proposed concept will provide time-resolved recession measurements that can be used for model validation (both during arc jet test and flight tests). With validated predictive models, NASA can optimize the heat shield design for expected reentry conditions. Additionally, reliable onboard real-time recession measurements could possibly be used to identify localized excessive recession. This diagnostic could be integrated with capsule flight control system to orient the vehicle to reduce heating loads in damaged areas. Furthermore, this technology could be used to monitor Mars entry events whose heat shields cannot be physically inspected post-entry. Commercial and DoD applications also exist. For instance, SpaceX (Dragon), Blue Origin (New Shepard), and Boeing (CST-100) are pursuing capsule reentry capabilities. DoD is developing hypersonic cruise vehicles in support of Conventional Prompt Global Strike. These test vehicles undergo very high heating rates which stresses the Thermal Protective System (TPS) design. Non-invasive recession measurements are needed to support development of an optimal TPS.



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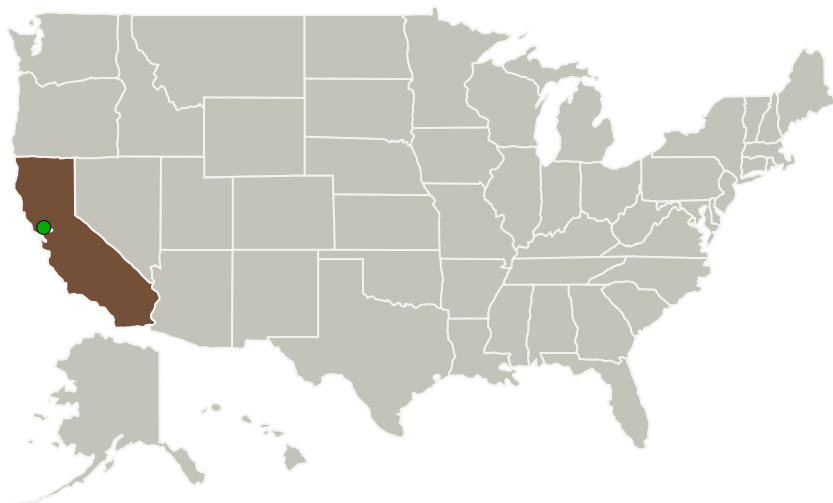
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Opto-Knowledge Systems, Inc.(OKSI)	Lead Organization	Industry	Torrance, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

### Primary U.S. Work Locations

California

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Opto-Knowledge Systems, Inc. (OKSI)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Managers:**Mairead Stackpoole  
Ryszard L Pisarski**Principal Investigator:**

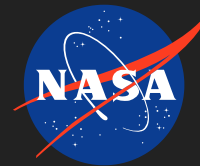
Tait Pottebaum

**Co-Investigator:**

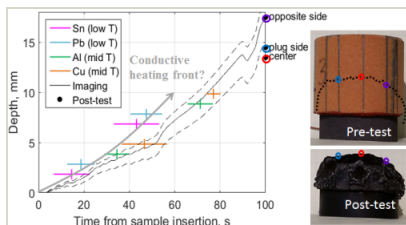
Gordon Scriven

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## Images

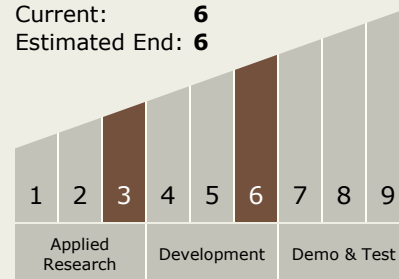


## Briefing Chart Image

Heat Shield Recession  
Measurements Using Remote  
Spectral Sensors, Phase II  
(<https://techport.nasa.gov/image/136018>)

## Technology Maturity (TRL)

Start: **3**  
Current: **6**  
Estimated End: **6**



## Target Destinations

The Sun, Earth, The Moon,  
Mars, Others Inside the Solar  
System, Outside the Solar  
System